

**APPENDIX E**

**STANDARD OPERATING PROCEDURES**

## **APPENDIX E -- STANDARD OPERATING PROCEDURES FOR THE NEVADA BROWNFIELDS PROGRAM**

This appendix contains references and web addresses for numerous standard operating procedures (SOPs) from the U.S. Environmental Protection Agency (EPA). General field sampling guidelines are included in the EPA SOP on General Field Sampling Guidelines. SOPs delineate the step-by-step approach that field personnel must follow in collecting samples, taking field measurements, decontaminating equipment, handling IDW, and calibrating instruments. Most qualified sampling contractors and State and Federally certified laboratories develop SOPs and analytical methods as part of their overall QA program. SOPs should be developed following “Guidance for Preparation of Standard Operating Procedures for Quality-Related Operations” (EPA 1995). The field team should document which SOPs they are using in the field and any deviations from an SOP.

EPA SOPs for field sampling methods are available for download at <http://www.ert.org/mainContent.asp?section=Products&subsection=List>

Field personnel will ensure that all sampling equipment has been properly assembled, decontaminated, calibrated, and is functioning properly prior to use. Equipment will be used according to manufacturer’s instructions, and should generally be decontaminated according to the EPA SOP-Sampling Equipment Decontamination.

Soil samples are typically collected at Brownfields sites and may include surface and subsurface samples. Sample types may be discrete or composite samples. There are a variety of acceptable methods for collection of soil samples, and selection of an appropriate method will depend on site conditions. Methods commonly used to collect soil samples include drilling soil borings, digging test pits, sampling via hand auger, and digging with a shovel or trowel. Additional information on the collection of soil samples can be found in EPA’s Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies (1992) and in the referenced EPA SOP for soil sampling .

Groundwater samples collected using soil borings allow for the collection of one-time discrete groundwater samples at a specific depth interval at a point in time. One-time groundwater samples are often used to help select locations for future monitoring wells. These one-time samples are often collected using a direct-push method, which is described in the SOP for direct-push groundwater sampling. Collection of groundwater samples from monitoring wells is described in the EPA SOPs for groundwater well sampling, monitoring well installation, and monitoring well development.

Surface water samples include representative liquid samples collected from streams, brooks, rivers, lakes, ponds, lagoons, seeps, estuaries, drainage ways, sewers, channels, wetlands, surface water impoundments, and other surface water bodies. These samples can also be collected from the surface or at depth. Surface water samples should be collected in general accordance with the EPA SOP for surface water sampling.

Sediment samples can be collected for analysis of biological, chemical, or physical parameters. There are many factors to consider when choosing sediment sampling

equipment, including, but not limited to, site access, sample volume requirements, sediment texture, target depth for sediment collection, and flowing versus standing water. In general, piston samplers are best used for soft, fine-grained sediments where sediments at depth are required. Grab/dredge samplers are best for coarse, shallow sediments and where large volumes of sediment are required. Additional information on the collection of sediment samples is provided in EPA's SOP for sediment sampling.

Sampling of sludge could involve a number of different situations and will likely depend upon site conditions. Therefore, details of collecting sludge samples should be described in a site-specific SAP. Common settings where sludge is sampled include catch basins and drywells.

Air sampling is typically conducted at sites where vapor intrusion may be an exposure pathway for contaminants. Air sampling is more complex than soil or water sampling because of the reactivity of chemical compounds in the gas matrix and sample interaction with the sampling equipment and media. Air sampling equipment is selected based on a number of factors including site conditions, sampling objectives, contaminants of concern, analytical methods, and cost. Methods to sample air at active facilities include (but are not limited to) soil gas sampling or sampling with flux chambers. Typical sampling containers include tedlar bags, stainless steel Summa canisters, and glass sorbent traps used with sampling pumps. More information on air sampling and analysis can be found at: <http://www.airtoxics.com/> and in EPA's SOP for general air sampling guidelines.

Because sampling at Brownfields sites can often involve buildings slated for reuse, there is a potential for non-routine sampling of unusual sample matrices, such as building materials. These matrices include lead-based paint, asbestos-containing materials, and other types of building materials. Site-specific sample collection procedures will likely need to be developed for sampling such non-routine matrices. Sampling personnel should coordinate with the analytical laboratory on the anticipated sample collection and handling methods to ensure that the sample data will not be rejected. Additional information on the collection of non-routine sample matrices is in EPA's SOP for chip, wipe, and sweep sampling.

Custody procedures differ among laboratories. Custody procedures of the analyzing laboratory are identified prior to field activities. Field personnel must make arrangements with the appropriate laboratory for proper sample containers, preservatives, holding times, and sampling request forms. Sample custody must be traceable from the time of sample collection until results are reported. Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. A chain-of-custody form must be completed after sample collection and prior to sample shipment or release. The chain-of-custody form, sample labels, and field documentation must be cross checked to verify sample identification, type of analyses, number of containers, sample volume, preservatives and type of containers. Additional information on sample handling and custody procedures can be found in EPA SOPs for specific sample collection methods, Section 4 of EPA's Quality Assurance Guidance for Conducting Brownfields Site Assessments (EPA 1998), and in Section 3 of EPA's

Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (2001). SOPs and forms for sample handling, custody (chain-of-custody forms), and transport are referenced in this appendix.

The laboratory's QA plan and written SOPs will describe specific preventive maintenance procedures for equipment maintained by the laboratory. These documents identify the personnel responsible for major, preventive, and daily maintenance procedures, the frequency and type of maintenance performed, and procedures for documenting maintenance activities.

The following list provides references and web addresses for a variety of SOPs provided by the EPA:

### **Field Measurements**

pH and Dissolved Oxygen: US EPA Region 6. *SOP for pH and Dissolved Oxygen Instrument Calibration*, May 15, 2000.

Multi-Parameter Measurement: US EPA Region 1. *Standard Operating Procedure for Calibration and Field Measurement Procedures for the YSI Model 6-Series SONDES and Data Logger (Including: Temperature, pH, Specific Conductance, Turbidity, Dissolved Oxygen, Chlorophyll, Rhodamine WT, ORP, and Barometric Pressure)*, Revision 7, June 7, 2005.

Multi-Parameter Calibration: US EPA Region 1. *Draft Calibration of Field Instruments (Temperature, pH, Dissolved Oxygen, Conductivity/Specific Conductance, Oxidation Reduction Potential [ORP], and Turbidity)*, Draft, June 3, 1998.

### **Miscellaneous Field Procedures**

General Sampling: Environmental Response Team (ERT), US EPA. *General Field Sampling Guidelines*, SOP No. 2001, Revision 0.0. August 11, 1994.

### **Equipment Decontamination**

Environmental Response Team (ERT), US EPA. *Sampling Equipment Decontamination*, SOP No. 2006, Revision 0.0. August 11, 1994.

US EPA Region 9. *Sampling Equipment Decontamination*, SOP No. 1230, Revision 1. September 1999.

**Stream Flow Measurements:** US EPA Region 6. *SOP for Stream Flow Measurement*. Update Jan. 31, 2003.

**Electrofishing:** US EPA Region 1. *Sampling of Fish in Wadeable Streams Through the Use of Electrofishing*, Revision 3. August 14, 2003.

**Boat Transport & Operation for Sampling:** US EPA Region 1. *Transporting and Operating Boats*, Revision 1. June 26, 2002.

**Canopy Cover and Gradient/Slope Estimation:** US EPA Region 6. *Canopy Cover and Gradient/Slope Estimation Procedures*, February 6, 2004.

### **Surface Water Sampling**

Environmental Response Team (ERT), US EPA. *Surface Water Sampling*, SOP No. 2013, Revision 0.0. November 17, 1994.

US EPA Region 1. *Collection of Chemical and Biological Ambient Water Samples*, Revision 1. July 24, 2002.

US EPA Region 9. *Surface Water Sampling*, SOP No. 1225, Revision 1. September 1999.

### **Methods Associated with Low-Level Metals Analysis**

US EPA Region 6. *Water-Quality Samples for Dissolved Metals-in-Water*, SOP No. , Revision 0. January 13, 2000.

US EPA Region 9. *Trace Metal Clean Sampling of Natural Waters*, SOP No. 1229, Revision 0. July 26, 2004.

### **Sediment Sampling**

General Methods: Environmental Response Team (ERT), US EPA. *Sediment Sampling*, SOP No. 2016, Revision 0.0. November 17, 1994.

US EPA Region 1. *Soil, Sediment, and Solid Waste Sampling*, Revision 2. February 13, 2004.

US EPA Region 9. *Sediment Sampling*, SOP No. 1215, Revision 1. September 1999.

### **Groundwater Sampling**

#### **Monitoring Well Installation & Activities:**

GeoprobeJ - Environmental Response Team (ERT), US EPA. *Model 5400 GeoprobeJ Operation*, SOP No. 2050, Revision 0.0. March 27, 1996.

US EPA Region 1. *Groundwater Monitoring Well Installation Using Geoprobe7*, Revision 1. June 20, 2002.

Environmental Response Team (ERT), US EPA. *Water Level Measurement*, SOP No. 2043, Revision 0.0. October 3, 1994.

Well Development - Environmental Response Team (ERT), US EPA. *Well Development*, SOP No. 2044, Revision 0.0. October 3, 1994.

US EPA Region 1. *Collection of Low Level Metals Ambient Water Samples*, Revision 1. September 4, 2003.

### **Sampling:**

Environmental Response Team (ERT), US EPA. *Groundwater Well Sampling*, SOP No. 2007, Revision 0.0. January 26, 1995.

US EPA Region 1. *Groundwater Sampling*, Revision 0. January 9, 2003.

US EPA Region 9. *Groundwater Well Sampling*, SOP No. 1220, Revision 1. September 1999.

Low Flow - US EPA Region 1. *Low-Stress (Low-Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, SOP No. GW 0001, Revision 2. July 30, 1996.

### **Soil Sampling**

Environmental Response Team (ERT), US EPA. *Soil Sampling*, SOP No. 2012, Revision 0.0. February 18, 2000.

US EPA Region 9. *Soil Sampling*, SOP No. 1205, Revision 2. September 1999.

Sampling for Volatile Compounds: US EPA Region 9. *Soil Sampling for Volatile Compounds*, SOP No. 1210, Revision 1. September 1999.

### **Miscellaneous/Documentation**

Sample Login/Tracking/Disposition: US EPA Region 1. *Sample Login, Tracking, and Sample Disposition*, EIA-ADMLOG10.SOP, Revision 1. July 26, 2002.

Chain of Custody: US EPA Region 1. *Chain of Custody of Samples*, Revision 1. March 25, 2002.

Document Control: US EPA Region 1, Office of Environmental Measurement and Evaluation. *Document Control*, EQASOP-DocContrlSOP0, Revision 0. February 18, 2004.

### **Website Links**

Environmental Response Team (ERT), US EPA:  
<http://www.ert.org/mainContent.asp?section=Products&subsection=List>

Guidance for Preparing Standard Operating Procedures, US EPA:  
<http://www.epa.gov/quality/sops.html>

Standard Operating Procedures for Laboratories, US EPA Region 9:  
<http://www.epa.gov/region9/lab/sops.html>

Standard Operating Procedures for NELAC, US EPA:

<http://www.epa.gov/nelac/sops1.html>

Standard Operating Procedures for Streamflow Measurements, US EPA Region 6:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/misc\\_field\\_procedures/r6flowmeasure\\_sop013103.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/misc_field_procedures/r6flowmeasure_sop013103.pdf)

Standard Operating Procedures for Calibration of Field Instruments and Measurement of Field Parameters, US EPA Region 6:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/field\\_measurements/ecasop-ysi%20.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/field_measurements/ecasop-ysi%20.pdf)

Standard Operating Procedures for Soil, Sediment, and Solid Waste Sampling, US EPA Region 1:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/sediment\\_sampling/r1-eiasop-soil\\_sed\\_solid.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/sediment_sampling/r1-eiasop-soil_sed_solid.pdf)

Standard Operating Procedures for Groundwater Monitoring Well Installation Using the Geoprobe, US EPA Region 1:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/groundwater/monitoring\\_well\\_installation/r1-gw-monitor\\_Well.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/groundwater/monitoring_well_installation/r1-gw-monitor_Well.pdf)

Standard Operating Procedures for Soil Sampling, US EPA Environmental Response Team:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/soil\\_sampling/ertsop2012-soil.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/soil_sampling/ertsop2012-soil.pdf)

Standard Operating Procedures for Chain of Custody for Samples, US EPA Region 1:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/misc\\_docs/r1\\_chain-of-custody.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/misc_docs/r1_chain-of-custody.pdf)

Standard Operating Procedures for Calibration of pH and Dissolved Oxygen Instruments, US EPA Region 6:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/field\\_measurements/r6\\_ph\\_do\\_Instru-Calibrate\\_sop.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/field_measurements/r6_ph_do_Instru-Calibrate_sop.pdf)

Standard Operating Procedures for Groundwater Sampling, US EPA Region 1:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/groundwater/sampling/r1\\_gw\\_sampling.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/groundwater/sampling/r1_gw_sampling.pdf)

Standard Operating Procedures for Sample Login, Tracking, and Disposition, US EPA Region 1:

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/misc\\_docs/r1\\_sample\\_tracking-n-disposal.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/misc_docs/r1_sample_tracking-n-disposal.pdf)

Standard Operating Procedure for Collection of Air and Precipitation Samples, IADN

Project: <http://www.epa.gov/glnpo/monitoring/air/iadn/FieldSOP2005.pdf>

Data Validation Standard Operating Procedures for CLP Routine Analytical Services, US EPA Region 4: <http://www.epa.gov/Region4/sesd/oqa/rassop.pdf>

Global Positioning System (GPS) Project and Quality Assurance Considerations and Standard Operating Procedure, US EPA Region 8:  
<http://www.epa.gov/Region06/6en/gis-qa/iiiqatools/r8%20gps%20sop.pdf>

Environmental Investigations, Standard Operating Procedures and Quality Assurance Manual, US EPA Region 4, November 2001:

<http://www.epa.gov/Region4/sesd/eisopqam/eisopqam.pdf>

<http://www.epa.gov/quality/sops.html>

<http://www.epa.gov/region9/lab/sops.html>

<http://www.epa.gov/nelac/sops1.html>

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/misc\\_field\\_procedures/r6flowmeasure\\_sop013103.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/misc_field_procedures/r6flowmeasure_sop013103.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/field\\_measurements/ecasop-ysi%20.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/field_measurements/ecasop-ysi%20.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/sediment\\_sampling/r1-eiasop-soil\\_sed\\_solid.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/sediment_sampling/r1-eiasop-soil_sed_solid.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/groundwater/monitoring\\_well\\_installation/r1-gw-monitor\\_Well.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/groundwater/monitoring_well_installation/r1-gw-monitor_Well.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/soil\\_sampling/ertsop2012-soil.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/soil_sampling/ertsop2012-soil.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/misc\\_docs/r1\\_chain-of-custody.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/misc_docs/r1_chain-of-custody.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/field\\_measurements/r6\\_phdo\\_Instru-Calibrate\\_sop.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/field_measurements/r6_phdo_Instru-Calibrate_sop.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/groundwater/sampling/r1\\_gw\\_sampling.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/groundwater/sampling/r1_gw_sampling.pdf)

[http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5\\_sops/misc\\_docs/r1\\_sample\\_tracking-n-disposal.pdf](http://www.epa.gov/arkansas/6pd/qa/qadevtools/mod5_sops/misc_docs/r1_sample_tracking-n-disposal.pdf)



<http://www.epa.gov/glnpo/monitoring/air/iadn/FieldSOP2005.pdf>